BEFORE THE
FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, D.C. 20554

In the Matter of	)	
	)	
2000 Biennial Regulatory Review --	)	IB Docket No. 00-248
Streamlining and Other Revisions of	)	
Part 25 of the Commission's Rules	)	
Governing the Licensing of, and	)	
Spectrum Usage by, Satellite Network	)	
Earth Stations and Space Stations	)	

REPLY COMMENTS OF QUALCOMM INCORPORATED

QUALCOMM Incorporated ("QUALCOMM"), pursuant to Section 1.405 of the Commission's Rules and Regulations, respectfully submits these reply comments in response to the Commission's Further Notice of Proposed Rule Making ("FNPRM"), IB Docket No. 00-248, released September 26, 2002, and in response to various comments filed by other entities in these proceedings.

I. The Commission should adopt a statistical approach for power levels for transmitting earth stations, at least in the Ka-band, to accommodate new technologies.

QUALCOMM in its initial comments proposed the adoption of a cumulative distribution function (CDF) approach to define interference in VSAT networks, which would accommodate new technologies without causing unacceptable interference to adjacent satellite systems. With regard to utilizing a statistical approach to define interference levels for VSATs, QUALCOMM notes with interest the comments of SIA on whether Part 25.134(a) should be revised to reflect the higher powers that result when ALOHA random access techniques are used. SIA states,

> [I]t is unnecessary to impose power reduction for ALOHA access techniques. Virtually all of the hundreds of thousands of VSAT terminals currently in use employ ALOHA access technique at least part of the time, and extensive experience with these networks has demonstrated that this access technique is not a cause of significant or even detectable interference with adjacent systems.[1]

[1] SIA Comments at B. 1., page 18.

It appears from these comments that these terminals, operated by a majority of the industry, exceed the peak power levels allowed by 25.134(a), if only for brief intervals.

QUALCOMM agrees with SIA and other commenting parties that it is unlikely current operations will cause unacceptable adjacent satellite interference. However, QUALCOMM believes that the regulations need to be revised to recognize that power levels are exceeded for brief periods of time. While QUALCOMM agrees with the existing satellite operators that current systems should be permitted to operate in the same manner (either pursuant to grandfathering or through maintenance of the existing Part 25.134(a)), we think it is critical that the Commission address this matter now to ensure that new innovative technologies, which may also exceed the peak power rules for very short periods of time, are not disadvantaged. Failure to address this issue at this time would discriminate against new technologies by requiring that applicants seek a waiver of the Commission's rules and demonstrate they will do no harm. In the case of both operating and proposed systems, it could be demonstrated that there would be no adverse impact on adjacent satellite operations.

Regardless of the approach taken by the Commission in addressing power levels in the C and Ku-bands, the Commission can and should adopt an appropriate statistical method for the Ka-band. Since Part 25 has a separate section governing licensing of VSAT terminals at Ka-band, QUALCOMM proposes, at a minimum, that rules employing statistical methods be used to govern adjacent satellite interference in that band. Accordingly, we suggest that our initial comments regarding statistical methods be used as a guide to revise Part 25.138 (a). This approach would provide a realistic and improved operating environment for new and innovative technologies operating in the Ka-band. At the same, this approach would not impact continued use of ALOHA techniques, mixed with traditional FDMA, TDMA and CDMA pursuant to existing Part 25.134 (a).

In this regard, the FCC proposal to use a statistical approach to accommodate the use of ALOHA techniques is a step in the right direction. However, the SIA proposal, to be used in the event

the Commission revises its rules, is an improvement upon the approach in the FNPRM. Furthermore, the SIA proposal recognizes that different VSAT networks operate using different transmission durations, and that this should be taken into account in any rule change. QUALCOMM agrees with SIA's observation, but believes that our proposal is an even greater improvement. The QUALCOMM proposal would apply the rule revision to all random access techniques. The joint Spacenet and StarBand proposal is similar in some ways to the QUALCOMM approach in that it would allow increasing values of interference, but only with an ever-decreasing probability of occurrence. Again, the QUALCOMM proposal has the advantage of using standard statistical terminology, which will be familiar to most users of Part 25 of the Commission's rules.

With regard to the proposal of Aloha Networks to limit the probability and exceedence duration events in the Commission's rules, QUALCOMM believes that a more prudent course would be to adopt a 0.1% limit, at least for an interim period, and then later consider increasing the value to 1% if appropriate based on operational experience. In addition, QUALCOMM believes that the short exceedence duration proposed by Aloha Networks is overly conservative. As discussed above, the rule should be general enough to apply to all systems using random access techniques, not only to those using the ALOHA method or other contention protocols. As a means of further elaboration, QUALCOMM below provides additional detail on ways in which exceedence durations should be established.

One of the Commission's proposals at ¶90 is that the maximum duration of any single collision be less than 100 milliseconds. QUALCOMM observes that if an interference allowance mask based on a cumulative distribution function were utilized,[2] the ability for victim systems to tolerate ESD interference peaks would depend upon the effective integration time (inverse of the bandwidth) of the

[2] See, e.g., QUALCOMM's comments, page 8.

space station and earth station control parameters AND upon the "perceptions of quality" of the users of the victim system.

In addition, with regard to developing an exceedence time duration, QUALCOMM observes that first, in principle, exceedence times could be as short as some constant multiplied by the reciprocal bandwidth of the narrowest bandwidth user (say 1/4 kHz or 1/40 kHz). If this concept were adopted, during periods of high peak demand the peak signal ensemble would appear like thermal noise at the victim receiver. This method of defining the exceedence duration is clearly too rigid and the outcome is undesirable.

Second, any one station should not drive the time duration of exceedence given that a single user is only one of many interferers. In an effort to establish a generic regulation, the direct application of a maximum time for exceedence must take this into consideration.

Third, the perception of degradation in the quality of service to a victim station operating digitally can be discussed in terms of the characteristics of the victim station application. Consider the following types of operation associated with the victim station:

1) Machine-to-machine communications

2) Machine-to-person communications

3) Person-to-person communications

In the case of machine-to-machine communications, such as those associated with large data block transfers, delays caused by a power exceedence event created by one or more interferers could last, for example, from one to ten seconds without undue degradation of service quality. Cases 2) and 3) both involve human interaction and are more sensitive to communications outages. Digital video, web browsing and smaller file transfers are examples of these classes. Outages of up to one second (caused by interferer power exceedence) are likely to be acceptable, provided that the CDF statistics are also complied with. Care should be taken to avoid confusing the actual duration of exceedence with the allowable percentage of time for which the exceedence can occur.

Finally, Ka-band propagation effects, if uncorrected, could result in outage periods of several seconds (indeed minutes). Even with correction for propagation effects, time constants for adjustment could be in excess of one second. This primarily results from the two-way, round-trip delay associated with any control loop utilizing a geostationary satellite communications system. As such, power exceedence durations as a result of propagation should be ignored in developing the FCC's rules, since the environment will subject all systems to such outages.

Taking the above factors into consideration, QUALCOMM believes that from the perspective of a victim station, an exceedence duration from a transmitting station on the order of one second would not cause unacceptable interference. This exceedence duration criterion is technology-neutral, and should support the introduction of new technologies.

If the Commission chooses to adopt the rule that it initially proposed, or the SIA variant, QUALCOMM believes it will be faced with new applicants in the very near future looking for additional changes or waivers of the rules. For example, Part 25.138(a)(1) in its current form, with regard to CDMA systems, would not accommodate advanced CDMA systems already developed. Thus, the rule as currently written could act as a barrier to a new, efficient method of operation. The Commission should take care to ensure that its rules or rule revisions do not inadvertently discourage innovation and new technologies.

II. The Commission should not adopt new onerous requirements addressing antenna pointing accuracy.

In the FNPRM at ¶43 the Commission noted,

> PanAmSat proposes several new rules for those [VSAT] terminals, including the following: (1) requiring systems to inhibit transmit capability until correct earth station pointing can be verified; (2) requiring systems to be able to shut off transmit capability remotely; (3) having terminals professionally installed unless (1) and (2) are achieved; and (4) having the ability to trace interference to individual subscribers.

Several commenting parties, including SIA, Spacenet and Starband, suggest that PanAmSat's proposals are unwarranted or amount to the "micromanagement" of sub-meter antenna pointing.[3] QUALCOMM believes the objective of reducing the pointing error of VSAT antennas is sound, but agrees with the commenting parties who oppose stringent new rules that would impose unwarranted burdens on system operators. While QUALCOMM's primary concern is with Ka-band terminals, we believe that additional regulations applied in the lower bands might in the future be applied to systems in the Ka-band as well. Our specific concerns are as follows.

First**,** the technologies proposed here by PanAmSat may require the use of proprietary techniques or equipment. The Commission should seek to avoid imposing rules that might require the use of proprietary solutions, such as "safety locks" associated with off-axis emission levels. The Commission's rules should focus on the objective of avoiding adjacent satellite interference, rather than on specific mechanisms.

Second, the Commission should not adopt a regulation that mandates professional installation of terminals. The objective of addressing concerns about potential adjacent satellite interference can be addressed through other means. The Commission could require certification to be made by an operator, which would assure the Commission that suitable technical means will be used to avoid excessive off-axis emissions regardless of the individual doing the installation. At most, the Commission might require a showing of means an operator utilizes.

In conclusion, QUALCOMM agrees with the majority of the other commenting parties that the industry has shown it currently operates without causing unacceptable adjacent satellite interference. Therefore, as new systems are deployed in the Ka-band, the Commission should seek to avoid imposing additional regulatory burdens in the absence of a demonstrated need.

[3] Joint Comments of Spacenet Inc. and StarBand Communications Inc. at p. 9.

III. The Commission should adopt a backlobe requirement for Ka-band uplinks.

In the FNPRM at ¶69 the Commission invited comment on

> [W]hether to apply this reduced backlobe requirement to Ka-band earth stations for frequency bands not shared with terrestrial services, in addition to conventional Ku-band earth stations as discussed above. We also note that the 18.58-18.8 GHz and 18.8-19.3 GHz bands are shared with the Fixed Service, but only until June 8, 2010. Therefore, we propose to retain the current –10 dBi backlobe limit in these bands and to increase the limit to 0 dBi in these bands starting June 9, 2010.

With respect to backlobe antenna gain patterns, most commenting parties agreed with the relaxation of these specific requirements. QUALCOMM agrees with the Commission that it is important to address the issue of backlobe performance of VSAT antennas. By specifically addressing the 18 GHz frequency bands in ¶69, the Commission has addressed the space-to-Earth links, thus addressing interference from other services into the VSAT receiver systems. QUALCOMM also urges the Commission to adopt backlobe antenna gain requirements in the Ka-band uplink band (Earth-to-space) between 27.5 and 29.25 GHz where services are shared.

In addition, the limits and transition dates proposed by the FCC seem sound. However, in general, QUALCOMM favors requirements that specify signal levels in terms of off-axis EIRP per unit of frequency (e.g. dBW/MHz), rather than those that require the application of two separate regulations - one for power density into the antenna and another for antenna gain vs. angle from boresight.

IV. Other sections of Part 25 can be improved and clarified.

In our initial comments, QUALCOMM urged the Commission to adopt a statistical rule applicable to small earth stations, at least for satellite systems operating in the Ka-band. In the FNPRM at ¶105 the Commission notes,

> We also observe, however, that we have already adopted rules for Ka-band VSAT systems using CDMA, and those rules are very similar to the proposed rules for Ku-band VSAT systems. We do not believe that any further revisions are needed for these Ka-band VSAT systems. Therefore, we invite comment on not revising these rules.

QUALCOMM notes that some reasonable confusion exists between Parts 25.134 and 25.138 of the rules. We understand that the FCC intends Part 25.134 (a) to apply only to routinely processed VSAT terminals in the C and Ku-bands, while it intends Part 25.138 (a) to apply to routinely processed Ka-band VSAT terminals. However, there are a number of revisions that could be made to the rules to make this distinction clearer. For example, we note that it is not entirely clear which frequency bands within the FSS are addressed by 47 CFR Section 25.134(a). The rule begins, "***All*** applications for digital VSAT networks…". Therefore, the rule appears to be applicable to all bands where digital VSATs may be licensed. QUALCOMM believes that this is not the Commission's intention, and that it should be clarified accordingly. Our current understanding is that this regulation applies only to VSATs operating in the C and Ku-bands. However VSAT terminals do operate and will operate in the future in the Ka-band as well.

In addition, in the FNPRM at ¶137 the Commission requested comments on whether it should state input power limits to the earth station in terms of power spectral density into the antenna flange. QUALCOMM finds the limited introductory text provided by the Commission at the beginning of 47 CFR, Part 25.134(a) to be especially confusing. It reads, in part:

> All applications for digital VSAT networks with a maximum outbound downlink EIRP of +6.0 dBW/4 kHz per carrier and earth station antennas with maximum input power density of –14 dBW/4 kHz and maximum hub EIRP of 78.3 dBW will be processed routinely.

The phrase, "with maximum input power density of –14 dBW/4 kHz…" is particularly confusing since it is not clear if the meaning is related to a signal-in-space arriving via the antenna receive aperture or to power arriving from a transmitter into the waveguide flange of the antenna. It is not clear in this context whether the Commission is referring to a transmit antenna or a receive antenna. Since the FCC intends this to be the limitation of a transmitter, it would certainly improve the meaning if the regulation could be rewritten to read, "with a maximum transmitter power density into the flange of the

antenna of –14 dBW/4 kHz…". This would also bring this rule into alignment with Form 312, which requires that applicants for satellite earth stations provide precisely this information.

Finally, the quantity used for control of the space-to-Earth emission (+6.0 dBW/4 kHz per carrier – a power spectral density) is different than the quantity given in Part 25.208 (c) and (d) (e.g., -115 dBW/m² in any 1 MHz band – a power flux density) even though the intended use appears to be similar. It would be useful if the relationship between these two regulations and their units could be clarified. QUALCOMM also supports improvements to Part 25 that will clarify the sections applicable to each frequency band, service and terminal class, and multiplexing method. Because many revisions of Part 25 have been made over the years, the Commission should take care to ensure that its rules are clear for new entrants and applicants to the greatest extent possible. QUALCOMM believes that a hierarchical rewrite of the Commission's rules for the Satellite Service is appropriate at this time. A useful organization of the Part 25 rules could be:

1) Rules applicable by sub-service category: (FSS, NGSO-FSS, MSS, AMSS, LMSS, MMSS, BSS, DBS, etc.)
2) Rules applicable by band: (C-Band, Ku-Band, Ka-Band etc.)
3) Rules applicable by terminal type: (VSAT, Hub, Other, etc.)[4]

Such a rewrite should include a set of tables that cross-reference the applicable rules for each of the above categories.

V. Conclusion.

In summary, QUALCOMM supports the Commission's findings that statistical methods are needed to regulate interference from multiple satellite systems sharing orbit and spectrum resources. In our initial comments, we demonstrated how CDF functions can be used as an effective and more

[4] A fourth category associated with multiplexing and modulation method could be added here. However, we believe that these differences could be handled by the drafting of special notes to the proposed table. Further, if the statistical methods recommended by QUALCOMM's initial comment filing addressing the Random Access issues of the *Further Notice* were adopted, such an approach would be largely unnecessary. Under the QUALCOMM proposal all multiplexing methods (e.g., FDMA, TDMA, CDMA) would be treated on an equal basis.

generalized method of expressing statistically distributed interference power. We recognize there is reluctance to modify Part 25.134(a). QUALCOMM proposes a compromise that would modify Part 25.138(a) and apply statistical methods to the adjacent satellite interference rules applied in the Ka-band, leaving Part 25.134(a) intact. Furthermore, in addition to the utilization of statistical methods, QUALCOMM believes that the following proposals would further simplify the rules concerning control of interference to other satellite systems:

1) The allowable system level interference to other systems should be expressed in terms of EIRP Spectral Density as a function of off-boresight angle. Interference from and to VSAT terminals from terrestrial stations should continue to be controlled in terms of antenna gain (as given in Part 25.209).

2) An exceedence duration should also be specified in order for statistical methods to be effective.

QUALCOMM would like to thank the Commission for the opportunity to share our views on ways in which Part 25 of its rules might be improved.

Respectfully submitted,

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